AN EPIDEMIC OF TYPHOID FEVER DUE TO THE USE OF A POLLUTED WATER SUPPLY AT THE 1915 ASSEMBLY OF OLD SALEM CHAUTAUQUA[1]

By Harry F. Ferguson[2]

There resulted from the use of a polluted water supply at the 1915 Assembly of the Old Salem Chautauqua a large epidemic of typhoid fever which, though presenting nothing new from an epidemiological standpoint, serves to emphasize the danger of incurring typhoid fever infection at summer camps and picnic grounds where insanitary conditions are allowed to prevail and adequate attention is not given to the quality of the water supply. Sanitarians have realized that there is a tendency for persons to more or less abandon sanitary precautions while camping or on summer vacations to the country, and much has, therefore, been written on this subject warning people of the dangers involved. However, owing to the coming and going of vacationists and the scattered location of their homes it has generally proven difficult to obtain data on any large outbreak coming from a summer camp. In the Old Salem epidemic we have a striking example of such an outbreak, and it should serve as a warning to vacationists and to the management of summer resorts. The Old Salem Chautauqua Association, like many others, did not exercise due care, trusting to luck that nothing would happen and the experiment proved costly both in dollars and in the loss of lives.

The Old Salem Chautauqua grounds, comprising about 60 acres, are located in Menard County, Illinois, about a mile south of Petersburg. The Sangamon River, flowing in a northerly direction, forms the western boundary. The topography of the grounds is very pronounced with the exception of the northern part, where it is very flat and subject to overflow at high stages of the Sangamon River. Chautauqua assemblies have been held since 1897, or for 18 years, and there have been constructed in this time many buildings, including an auditorium, hotel, bathhouse, memorial and society

[1] Presented at Meeting of Illinois Section, January 25, 1916.

[2] Assistant Engineer Illinois State Water Supply.

buildings, and slightly over one hundred private cottages. The cottages are occupied by the owners and their friends during the assemblies and in addition many tents are erected to accommodate other campers. The Old Salem Chautauqua assemblies have been remarkably good, and have gained a widespread reputation. This

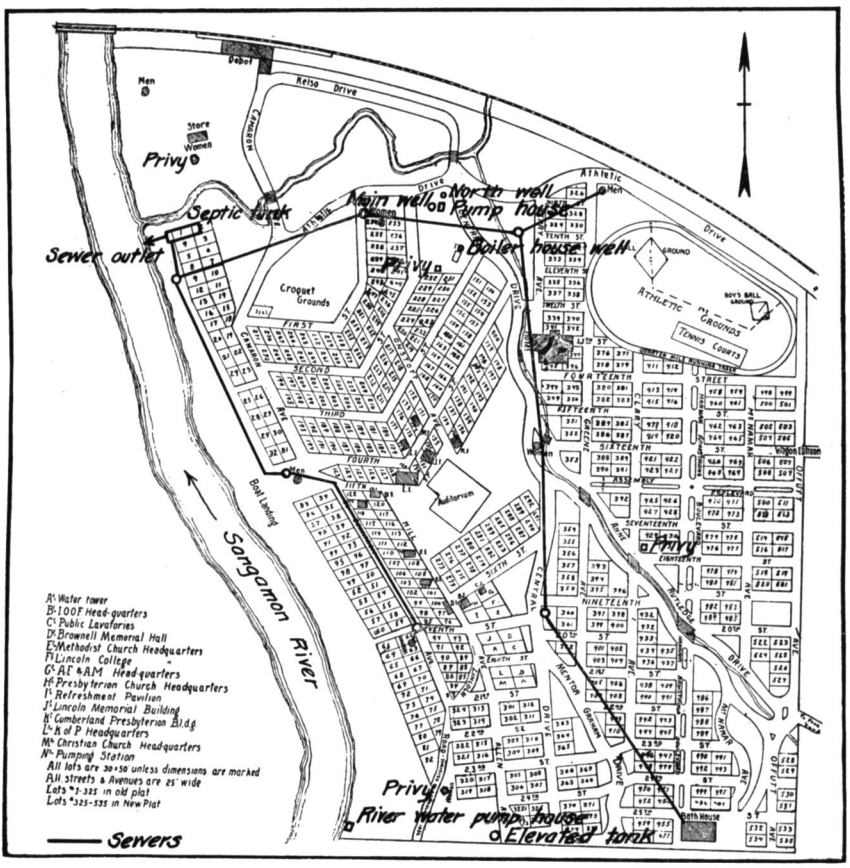

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FIG. 1. PLAT OF THE OLD SALEM CHATAUQUA GROUNDS, SHOWING LOCATION OF WATER WORKS AND SEWER SYSTEM

is shown by the fact that in 1905, 4000 people, coming from thirty-three states and territories and five foreign countries, lived on the grounds. Due to the advent of traveling Chautauquas the attendance has fallen off of late years, and the estimated daily attendance during the 1915 assembly varied between 500 and 3000.

In the early days of the Chautauqua public water supply and sewerage systems were installed. The sewer system covers practically the entire grounds and the sewage, after passing through a septic tank, is discharged into the Sangamon River at the northwest corner of the grounds.

There are two separate sources of water supply, namely, a supply from wells for domestic use, and a supply from the Sangamon River for the bathhouse, for flushing purposes and for use in the hotel

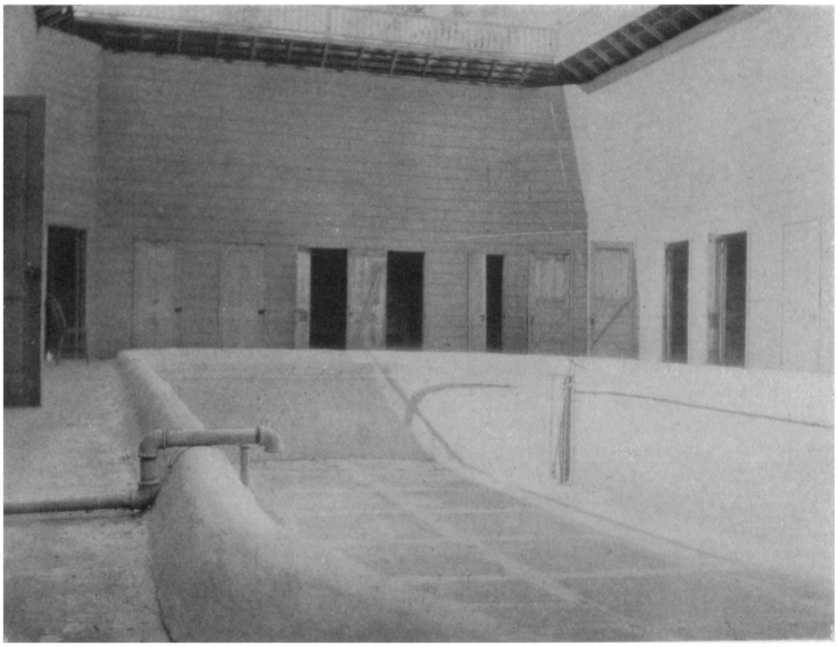

FIG. 2. INTERIOR OF BATH HOUSE AND SWIMMING POOL

kitchen. Polluted river water might well have caused typhoid, especially as used in a swimming pool at the bathhouse, but since there is no evidence that such was the case at this time, the river water supply will not be dwelt on here. It may be noted in passing, however, that a few cross connections between the river water and well supplies controlled by single valves existed in a few cottages.

The domestic supply is obtained from three dug wells located

on the low land at the northern end of the grounds (figs. 3 and 4). One of these wells which furnishes most of the water is designated the main well, and the other two, the north well and boiler house well, respectively.

The main well is about 8 feet in diameter and about 33 feet deep

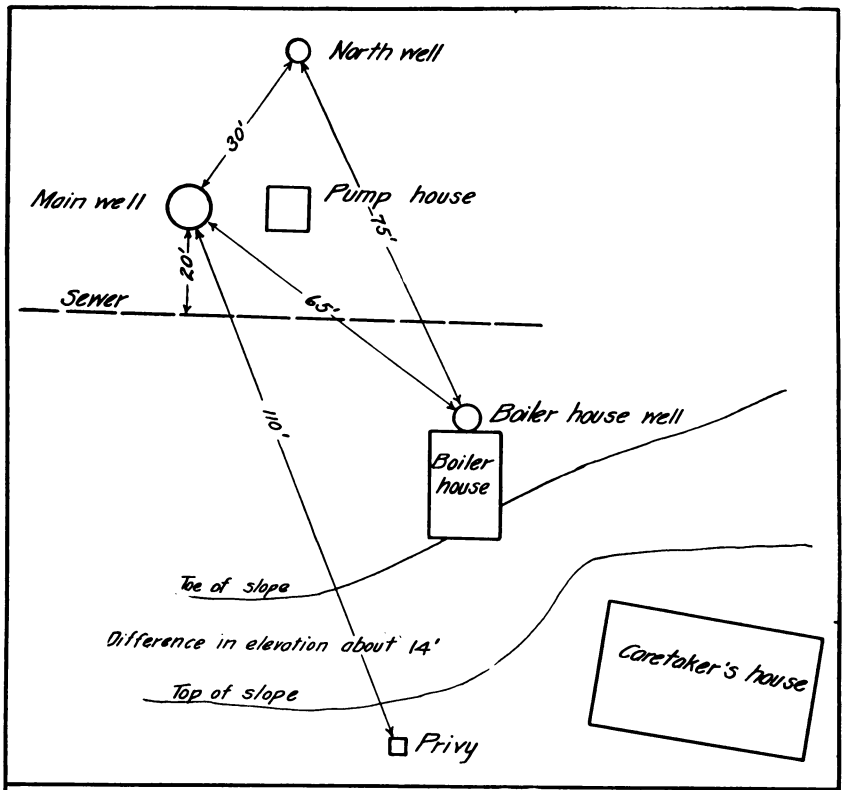

FIG. 3

below the ground level (figs. 5 and 6). The walls, which consist of two rings of brick laid with horizontal joints cemented, extend about 5 feet above the level of the ground, and are surrounded by an earthen embankment. Surmounting the walls is a conical

wooden roof. The walls are not water tight at any level and where a suction pipe enters the well several bricks have been removed. The earthen embankment is about 6 feet wide at the top and has side slopes of about 1:1. There is a hole in this embankment along the top of the suction pipe leading to an adjoining pump house and in addition there are several holes on the outside of the embankment evidently burrowed by field mice or other animals. Water is drawn from this well by means of a steam driven pump

FIG. 4. WATERWORKS

and discharged into a distribution system to which is connected an elevated tank.

The boiler house and north wells are also dug and walled with brick and are about 25 to 28 feet deep respectively. The walls of each rise only a few inches above the ground and are surmounted by plank covers which are not water tight. Both of these wells are provided with hand pumps, and in addition may be drawn on by a steam pump located in the top of one of them and discharging

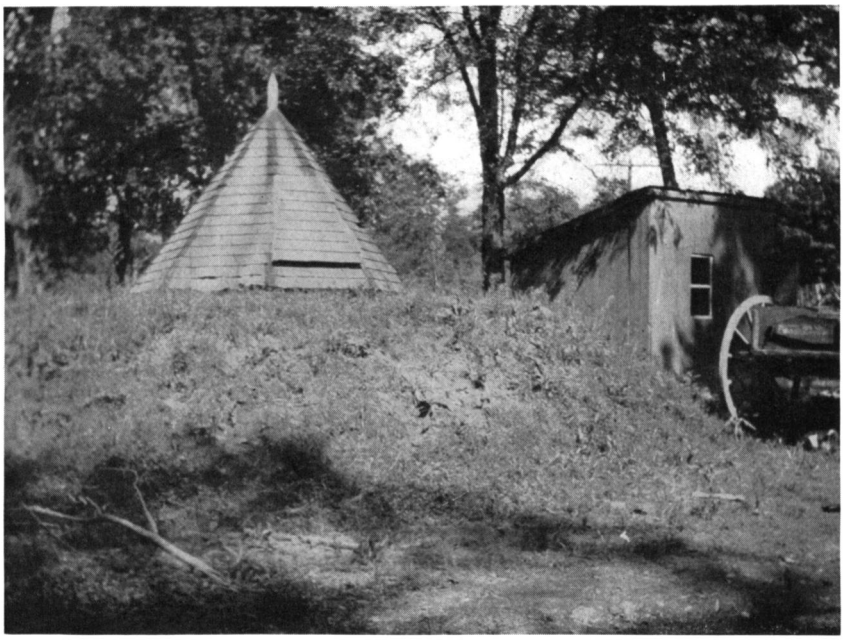

FIG 5. MAIN WELL AND PUMP HOUSE

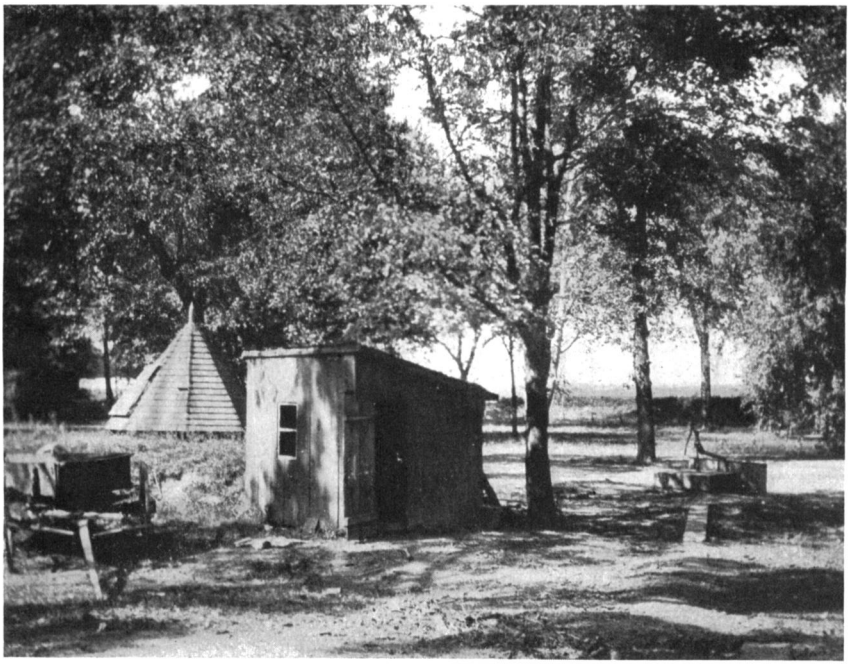

FIG. 6. MAIN WELL, PUMP HOUSE AND NORTH WELL

into the distribution system. This steam pump was not operated during the 1915 assembly.

The ground formation at these wells consists of a few feet of top soil, then a layer of clay to about 15 feet below the ground level, and then sand and gravel. The height of the water in the wells is materially affected by weather conditions and by the stage of the Sangamon River.

All three wells are subject at all times to more or less contamination. A sewer passes within about 16 feet of the main well and a privy is located only about 110 feet away and on ground about 14 feet higher than that at the wells and draining towards the wells.

The most serious danger of contamination, however, is by flood waters of the Sangamon River, and it was contamination in this manner that caused the outbreak of typhoid. The pollution carried by the Sangamon River water consists of the sewage of Springfield entering 27 miles upstream, possible wash from privies on the watershed between Springfield and the Chautauqua grounds, and the sewage from the Chautauqua grounds itself. Assuming a velocity of three miles per hour it would take only nine hours for the sewage of Springfield to reach the Chautauqua grounds.

The wells had previously been flooded during an assembly in 1907 resulting in a large outbreak of diarrhea. The cause of this diarrhea was so apparent at that time that the sickness became locally known as the "Chautauqua Quickstep." Thus the Chautauqua Association was aware of the dangers involved in continuing to use these wells as a source of water supply. Moreover, the State Water Survey, on the basis of analyses, had on three separate occasions notified the Chautauqua management that the water was not safe and should not be used unless boiled.

The 1915 assembly was held from August 11 to 25, inclusive. A few days before the close of the assembly, namely, on August 20 and 21, heavy rains occurred causing the Sangamon River to rise rapidly, overflow its banks, and inundate the northern part of the Chautauqua grounds where the wells are located. The flood waters submerged the north and boiler house wells and entirely surrounded the main well, rising within a few inches of the top of the earthen embankment. Unquestionably the polluted water seeped through the earthen embankment aided by the small holes of burrowing animals, for the water became quite turbid.

The pump pit became flooded but the pump was operated for

a while submerged, and since the water is pumped into a distribution system to which is connected an elevated tank (fig. 7), this polluted water was available for use under pressure during the last three or four days of the assembly.

When the well water became turbid and had a bad odor due to the pollution by the river water signs were placed on one or two

FIG. 7. ELEVATED TANKS

taps in the grounds, but many did not see these signs and others did not heed them. The water continued to be served at the hotel and restaurant.

About a day after the wells became polluted cases of diarrhea began to develop and the first case of typhoid fever occurred on September 1, ten days after the pollution took place. The actual

number of cases of diarrhea was not ascertained, but an estimate of 500 would be very conservative. Many of these were severe and prolonged and constituted a serious though non-fatal forerunner of the typhoid outbreak.

The detailed classification of the typhoid cases and the usual epidemiological evidence which was obtained relative to the milk, water and food supplies in order to determine the source of infection will not be presented here. In brief it may be stated that the epidemic of typhoid was very explosive in character involved a large number of cases, and though centering at Petersburg, Illinois, was widespread in extent even affecting communities outside the state. In all, 26 incorporated communities were affected and the most remote cases were two persons who were taken sick while visiting in California and entered a hospital in San Francisco. The first case occurred on September 1 and from then on there was a rapid development of cases until the middle of the month when about 150 cases were under care of physicians. During the latter half of the month new cases still continued to develop but in fewer numbers daily, and only a straggling of thirteen cases occurred during October. Most of these October cases, as well as a few of the later September cases, were found upon investigation to be of secondary origin, having received their infection from earlier patients.

In all, records were obtained of 201 cases of typhoid and although the infection was very severe only thirteen deaths were reported. Probably both the morbidity and mortality rates were higher than this since neither cases nor deaths were consistently reported and it was impossible to know or communicate personally with all persons who had been exposed to the infection.

DISCUSSION

MR. PAUL HANSEN: It is idle to endeavor to prevent the dissemination of typhoid fever by a polluted water supply by warning people against the use of the water, unless boiled or treated with hypochlorite, or in some other way rendered safe. This is not only illustrated very forcibly in the epidemic described by Mr. Ferguson, but it was also clearly brought out during the year 1904 in Columbus, Ohio. In the early part of that year there had been a typhoid epidemic of large proportions which was definitely traceable to the polluted city water supply. The public was warned

to boil the water, both through notices in the newspapers and by handbills left at every residence. Following this, a canvass was made of the city to ascertain if the people had heeded the warning. This canvass showed that only 33 per cent of the people had taken the precaution recommended.

The epidemic described by Mr. Ferguson is very significant of the danger lurking in the water supplies of Chautauqua grounds, summer resorts, fair grounds and other places where people congregate in the summer time. This work of Mr. Ferguson's which was done while employed by the State Board of Health has confirmed the board in a determination previously reached, that all Chautauqua grounds, summer resorts and fair grounds, should be investigated before the next open season.

Water is spoken of so often in connection with typhoid fever that in the minds of some, it has become almost, if not quite, the only cause of typhoid. There are many other causes of typhoid fever, some of which are very difficult to trace. Notable among these are oysters eaten raw. There is now under way an investigation by the State Board of Health of a mild epidemic of typhoid fever centering in Champaign, but also extending to a number of nearby communities. The evidence thus far obtained makes it appear quite certain that the great majority of the cases were infected by polluted oysters eaten raw. The efforts now being made are to ascertain the exact source of the polluted oysters and to learn if these same oysters have caused outbreaks of typhoid fever elsewhere. Though the evidence with reference to this phase of the work is not complete, it would appear that oysters from the same locality have caused epidemics in certain places in Indiana and Pennsylvania.

L. A. FRITZE: To eliminate typhoid epidemics among those who attend Chautauqua, go camping, etc., the health department in Moline, Illinois, gives away free of charge a four ounce bottle of chloride of lime to all citizens leaving on a vacation. A great many people camp along the Mississippi River using a water taken from a well situated possibly 10 feet from some outhouse. A number of these wells have been tested, showing a very badly polluted condition. The scheme was first in operation last year so the time is too soon to have shown results.

MR. H. P. LETTON:[1] In connection with the statements regarding typhoid fever in camps at Chautauquas and similar gatherings, the speaker would like to call the attention of the local or state health authorities to sanitary conditions, and especially to water supply conditions, on board excursion steamers operating intrastate on the Illinois River.

In connection with the work of the United States Public Health Service, regarding water supply conditions on vessels operating in interstate traffic, it was found that at Peoria, and possibly other points on the river, excursion steamers were being operated which did not come under our jurisdiction.

Some few samples were collected from these vessels, however, and almost uniformly they gave bad results. It is the belief of the speaker that this matter should be handled by the local authorities.

[1] Sanitary Engineer U. S. Marine Hospital.